The term investigate is defined as an opportunity for students to explore questions and develop content knowledge by making observations and inferences, collecting and interpreting data, and drawing tentative conclusions through the use of active learning strategies.

I. Inquiry

Process skills and inquiries are not an isolated unit of instruction and should be embedded throughout the content areas. Safety issues should be addressed as developmentally appropriate.

A. Process Skills

1. Observe

a. Use the senses to gather information about objects or events such as size, shape, color, texture, sound, position, and change (qualitative observations).

2. Classify

a. Compare, sort, and group concrete objects according to observable properties.

b. Arrange objects in sequential order.

3. Measure

a. Use standard (U.S. customary and metric) and nonstandard whole units to estimate and measure mass, length, volume, and temperature (quantitative observations).

4. Communicate

a. Use drawings, tables, graphs, written and oral language to describe objects and explain ideas and actions.

B. Inquiry

1. Plan and conduct a simple investigation.

a. Ask a question about objects, organisms, and events in the environment that could start an investigation.

b. Use simple equipment to gather data and extend the senses.

II. Life Science

Units of Study: Animals and Plants
My Body

A. Characteristics of Organisms

1. Organisms have basic needs.

a. Observe and describe how living things change as they grow.

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b. Investigate and identify the natural resources (food, water, and air) that living things need to survive. **(P)**

2. Humans have distinct body structures for walking, holding, seeing and talking.

a. Name major body parts.
b. Identify the uses of body parts.

3. Humans have senses including sight, smell, hearing, touch, and taste.

a. Describe the five senses.
b. Investigate using sensory organs associated with each of the senses.
c. Communicate using sensory descriptors (e.g., sweet, sour, bitter, salty, rough, smooth, hard, soft, cold, warm, hot, loud, high, low, bright, dull).

B. Life Cycles of Organisms

1. Plants and animals closely resemble their parents.

a. Observe that plants and animals go through a life cycle.
b. Observe and identify structures that are common between plants and animals and their offspring.
c. Compare offspring of plants and animals as similar but not identical to their parents and one another.

III. Earth Science

Units of Study: Rocks, Soil, and Water
Seasonal Changes

A. Properties of Earth Materials

1. Solid rocks, soils and water are earth materials.

a. Describe earth materials using the senses.
b. Explore the natural flow of water downhill.
c. Describe a way to conserve water at home or at school. **(P)**

2. Soils have properties of color and texture.

a. Compare a variety of soil samples.
b. Sort soil samples by a single attribute.

B. Changes in Earth and Sky

1. Weather changes from day to day and over the seasons.

a. Record weather observations pictorially.

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b. Name and describe the seasons.
c. Describe how seasonal changes may affect plants and animals.

IV. Physical Science

Unit of Study: Exploring Matter

A. Properties of Objects and Materials

1. Objects have many observable properties.

a. Examine, describe, and compare common physical properties of a variety of materials.
b. Observe and describe water as a solid or a liquid.
c. Observe, classify, and describe objects made of different materials, such as, paper, wood, fabric, and metal.
d. Observe that objects can move.

2. Objects can be described by the properties of the materials from which they are made and those properties can be used to separate or sort a group of objects or materials.

a. Classify materials that float/sink in water.
b. Investigate how magnets affect some materials and have useful applications as a tool.
c. Classify and describe everyday materials that can be recycled. **(P)**

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I. Inquiry

Process skills and inquiries are not an isolated unit of instruction and should be embedded throughout the content areas. Safety issues should be addressed as developmentally appropriate.

A. Process Skills

1. Observe

a. Use the senses to gather information about objects or events such as size, shape, color, texture, sound, position, and change (qualitative observations).

2. Classify

a. Compare, sort, and group concrete objects according to observable properties.

b. Arrange objects in sequential order.

3. Measure

a. Use standard (U.S. customary and metric) and nonstandard whole units to estimate and measure mass, length, volume, and temperature (quantitative observations).

4. Communicate

a. Use drawings, tables, graphs, written and oral language to describe objects and explain ideas and actions.

B. Inquiry

1. Plan and conduct a simple investigation.

a. Ask a question about objects, organisms, and events in the environment.

b. Employ simple equipment, such as hand lenses, thermometers, balances, etc., to gather data and extend the senses.

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II. Life Science

Unit of Study: Plants

A. Characteristics of Organisms

1. Organisms have basic needs.

a. Investigate and explain that plants require air, water, nutrients, space, and light to survive and reproduce.

2. Plants have basic structures.

a. Identify the parts of a plant (seeds, roots, stems, leaves, flower, and fruit).
b. Classify edible plant parts as seeds, roots, etc.
c. Explore and compare methods of seed dispersal.

B. Life Cycles of Organisms

1. Plants have life cycles. The details of the life cycle are different for different organisms.

a. Observe and communicate the growth and development of a variety of plants from seed.
b. Recognize that fruits and nuts come from flowers.

C. Organisms and Their Environments

1. Organisms can survive only in environments in which their needs can be met.

a. Classify plants according to their habitats.
b. Describe characteristics of plants that help them to survive in specific environments.

2. All organisms cause changes in the environment where they live.

a. Explore and describe that living things can change the environment.
b. Investigate how natural resources can be reused and recycled to reduce consumption. **(P)**

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III. Earth Science

Unit of Study: Things in the Sky

A. Objects in the Sky

1. **The sun, moon, and stars have properties, locations and movements that can be observed and described.**
   a. Observe and describe the basic relationships between the sun, moon, and Earth.
   b. Identify that the sun is a star and is the source of heat and light for Earth.

B. Changes in the Earth and Sky

1. **The sun and moon appear to move across the sky on a daily basis.**
   a. Observe and compare the day and the night sky.
   b. Observe and describe changes in shadows over time.
   c. Observe and describe the phases of the moon over time looking for patterns.

IV. Physical Science

Units of Study: Properties of Objects and Materials
Exploring Motion

A. Properties of Objects and Materials

1. **Objects have many observable properties, including size, mass, shape, color, and temperature.**
   a. Observe, describe, compare and classify common physical properties of matter.

2. **Properties of matter can be measured using tools, such as rulers, balances, and thermometers.**
   a. Measure length, mass, and temperature of various materials in nonstandard and standard units. (U.S. Customary and Metric Systems)
   b. Sort objects and materials based on a single attribute.

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3. Objects can be described by the properties of the materials from which they are made, and those properties can be used to separate or sort a group of objects or materials.

a. Investigate that some materials mix with water and others will not.
b. Make and separate simple mixtures.

4. Materials can exist in different states.

a. Explore and describe characteristics of solids.
b. Explore and describe characteristics of liquids.
c. Identify materials as either solid or liquid.

B. Position and Motion of Objects

1. The position and motion of objects can be changed by pushing and pulling.

a. Investigate the effect of a push or a pull on the position and motion of common objects.
b. Explore and describe patterns of motion.

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I. Inquiry

Process skills and inquiries are not an isolated unit of instruction and should be embedded throughout the content areas. Safety issues should be addressed as developmentally appropriate.

A. Process Skills

1. Observe

a. Use the senses to gather information about objects or events such as size, shape, color, texture, sound, position, and change (qualitative observations).

2. Classify

a. Compare, sort, and group concrete objects according to observable properties.
b. Arrange objects in sequential order.

3. Measure

a. Use standard (U.S. customary and metric) and nonstandard whole units to estimate and measure mass, length, volume, and temperature (quantitative observations).

4. Communicate

a. Use drawings, tables, graphs, written and oral language to describe objects and explain ideas and actions.

B. Inquiry

1. Plan and conduct a simple investigation.

a. Ask a question about objects, organisms, and events in the environment.
b. Plan and conduct a simple investigation.
c. Use simple equipment, such as hands lenses, thermometers, balances, rulers, etc., to gather data and extend the senses.
d. Communicate investigations and explanations.

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II. Life Science

Unit of Study: Animals

A. Characteristics of Organisms

1. Organisms have basic needs. Animals need air, water, and food.

a. Identify the basic needs of animals, including shelter and living space.

2. Organisms can survive only in environments in which their needs can be met.

a. Describe the relationship between animals and their habitats.

b. Group animals based on their habitats.

B. Life Cycles of Organisms

1. Animals have life cycles that include being born, developing into adults, reproducing, and eventually dying.

a. Observe and describe the growth and development of animals throughout their life cycles.

b. Investigate and understand that animals go through a series of orderly changes in their life cycles.

c. Observe growth in animals over time.

2. Animals closely resemble their parents.

a. Investigate that some animals go through distinct stages (metamorphosis) during their lives while others generally resemble their parents throughout their life cycle.

b. Classify animals based on their similarities.

C. Organisms and Their Environments

1. All animals depend on plants. Some animals eat plants for food. Other animals eat animals that eat the plants.

a. Investigate and describe ways in which animals interact with each other and with the environment.

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III. Earth Science

Unit of Study: Weather

A. Changes in the Earth and Sky

1. Weather changes from day to day and over the seasons.

a. Define components of weather, including temperature, wind, and precipitation (rain, sleet, snow, and hail).
b. Observe and identify weather conditions and patterns.
c. Create and use symbols to represent weather conditions.
d. Describe and sequence the seasons.
e. Identify safety precautions to use during severe weather conditions. **(P)**

2. Weather can be described by measurable quantities, such as temperature, wind direction, and precipitation.

a. Measure and record temperature in both degrees Fahrenheit and Celsius.
b. Measure and record precipitation.
c. Investigate and describe changes in wind direction and the motion of objects due to the wind.
d. Make simple charts and graphs of observed weather data.
e. Identify the importance of measuring and recording weather data. **(T)**
f. Compare drought and flood conditions.
g. Investigate and describe how weather affects water supply and water conservation. **(P)**

IV. Physical Science

Units of Study: Changes in Matter
Magnets

A. Property of Objects and Materials

1. Objects have many observable properties.

a. Examine and classify common physical properties of solids, liquids, and gases.

2. Materials can exist in different states — solid, liquid and gas. Some common materials, such as water, can be changed from one state to another.

a. Identify materials as solid, liquid, and gas.

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b. Demonstrate and describe how water and other materials change from one state to another.

3. Properties of matter can be measured using tools, such as rulers, balances, and thermometers.

a. Measure length, mass, volume, and temperature of various materials in standard (U.S. Customary and Metric Systems) units.

B. Magnetism

1. Magnets attract and repel each other and certain kinds of other materials.

a. Investigate and classify the results of magnetic forces on common objects (metals/nonmetals).

b. Demonstrate and describe how the poles of magnets attract and repel each other.

c. Give examples of useful applications of magnets (e.g., refrigerator magnet, can opener, magnetized screwdriver, magnetic compass). **(T)**

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I. Inquiry

Process skills and inquiries are not an isolated unit of instruction and should be embedded throughout the content areas. Safety issues should be addressed as developmentally appropriate.

A. Process Skills

1. Observe

a. Use the senses to gather information about objects or events such as size, shape, color, texture, sound, position, and change (qualitative observations).

2. Classify

a. Compare, sort, and group concrete objects according to two attributes.
b. Arrange objects in sequential order.

3. Measure

a. Use standard (U.S. customary and metric) to estimate and measure mass, length, area, perimeter, volume, and temperature to the nearest whole unit (quantitative observations).

4. Communicate

a. Use drawings, tables, graphs, written and oral language to describe objects and explain ideas and actions.

5. Infer

a. Explain or interpret an observation based on data and prior knowledge.

6. Predict

a. Use prior knowledge and observations to identify and explain in advance what will happen.

B. Inquiry

1. Plan and conduct a simple investigation

a. Ask a question about objects, organisms, and events in the environment.
b. Plan and conduct a simple investigation that represents a fair test.
c. Use simple equipment and tools to gather data and extend the senses.
d. Use data to construct a reasonable explanation.
e. Communicate investigations and explanations.

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II. Life Science

Unit of Study: Habitats and Adaptations

A. Characteristics of Organisms

1. Organisms can survive only in habitats in which their needs can be met.

a. Compare and contrast the basic needs of plants and animals.

b. Select and describe an appropriate habitat for a plant or animal.

2. Each plant or animal has different structures that serve different functions in growth, survival, and reproduction.

a. Investigate and predict how structural adaptations, such as methods of movement, defense, rearing young, camouflage, and mimicry function to allow animals to respond to life needs.

b. Recognize bones, joints, and muscles in the arms and legs of the human body as structural adaptations responsible for movement.

c. Investigate and predict how physical adaptations, such as seed dispersal, scent, color of flower, and tropism (light and gravity) function to allow plants to respond to life needs.

B. Life Cycles of Organisms

1. Many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment.

a. Compare and describe growth of living things based on observations and measurements over time including stages of development and life.

b. Record and describe the growth and development of a specific plant or animal over time.

C. Organisms and Their Environments

1. All animals depend on plants.

a. Investigate and predict ways living things will interact with each other and the environment.

b. Interpret the interdependency of plants and animals within a food chain by defining the following, producer, consumer, decomposer, herbivore, carnivore, omnivore, predator and prey.

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2. When the environment changes, some plants and animals survive and reproduce, and others die or move to new locations.

a. Describe how habitats and organisms change over time due to many influences (effects of natural forces, wind, rain, water, air, sunlight, and temperature).
b. Research and describe how habitats are managed and species are monitored in South Carolina. **(P)**
c. Investigate and describe behavioral adaptations, such as hibernation, migration, and dormancy, that allow living things to respond to seasonal conditions.
d. Investigate and describe that aquatic and terrestrial habitats support a diversity of plants and animals that share limited resources.
e. Investigate, communicate, and debate that natural events, natural resources and human influences can affect the survival/extinction of a species. **(P)**
f. Determine how humans impact natural resources (renewable and nonrenewable). **(P)**

III. Earth Science

Unit of Study: Earth Materials

A. Properties of Earth Materials

1. The varied earth materials have different physical properties and uses.

a. Describe earth materials (rocks, minerals, water, soil, and fossils) by their physical properties.
b. State similarities and differences among earth materials.
c. Classify similar earth materials (e.g., types of rocks/soils) according to their physical properties.
d. Recognize that rock, clay, silt, sand, and humus are components of soils.
e. Describe and show that soils are layered (topsoil, subsoil and bedrock).
f. Identify that soil provides support and nutrients for plant growth.
g. Observe and describe the unique physical characteristics of a variety of rock types.
h. Give examples of how humans obtain and use earth materials as resources. **(P, T)**
i. Explain how fossils provide evidence about prehistoric life and environments.
j. Explore careers in earth science. **(N)**

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2. The sun provides the heat necessary to maintain the temperature of the Earth.

a. Compare the effects of heat from the sun on various earth materials (rocks, soils, and water).

B. Changes in the Earth

1. The surface of the Earth changes.

a. Describe surface features of the Earth (mountains, hills, valleys, plateaus, plains, oceans, lakes and rivers).
b. Construct and interpret models that illustrate features of the Earth.
c. Compare some changes in the Earth's surface that are due to slow processes, such as erosion and weathering, with some changes that are due to rapid processes, such as landslides, volcanic eruptions, and earthquakes.
d. Infer how human behavior, such as farming, mining, and construction, changes the Earth's surface. **(P, N)**
e. Predict and explain the consequences of natural events, such as fire, flood, drought, erosion, earthquake, and volcanic eruption. **(P)**
f. Explore how technologies are used to help predict some natural events. **(T)**

IV. Physical Science

Units of Study: Heat and Changes of Matter
Machines and Motion

A. Property of Objects and Materials

1. Some common materials, such as water, can be changed from one state to another by heating or cooling.

a. Recognize and explore how matter can be changed in form (solid, liquid, and gas) through processes such as condensation, evaporation, melting, boiling, freezing, and sublimation (solid to gas, such as dry ice) and apply these processes to real world examples.
b. Measure, record, and graph the temperature (Celsius and Fahrenheit) of matter as it is heated and cooled.
c. Investigate the unique properties of water (expansion and contraction) as it is heated and cooled.
d. Compare the unique properties of water with other substances as they are heated and cooled.

2. **Heat can be produced in many ways, such as burning and rubbing or mixing one substance with another. Heat can move from one object to another by conduction.**
   a. Explore and identify things that produce heat.
   b. Explore and describe how heat moves from one object to another.
   c. Investigate and describe how heat travels by direct contact (conduction) so that a warmer object can warm a cooler object.
   d. Investigate and describe what materials can be used to prevent heat from moving from one object to another, such as insulators, and apply to real world examples.
   e. Describe ways to stop a fire from burning. **(P)**

B. Position and Motion of Objects

1. **The position and motion of objects can be changed by pushing or pulling. The size of the change is related to the strength of the push or pull.**
   a. Investigate and describe push and pull involved in simple machines.
   b. Identify and describe simple machines such as lever, pulley, wheel and axle, and inclined plane and apply their uses to real world situations. **(T)**
   c. Demonstrate how bones, joints and muscles are responsible for human movement and work as levers.
   d. Observe and identify examples of simple machines found in the school, playground, home, and work environment. **(P)**
   e. Observe the motion of simple machines in toys and in playground activities.
   f. Infer how simple machines developed as a result of human needs and exploration. **(T)**

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I. Inquiry

Process skills and inquiries are not an isolated unit of instruction and should be embedded throughout the content areas. Safety issues should be addressed as developmentally appropriate.

A. Process Skills

1. Observe

a. Use the senses and simple tools to gather information about objects or events such as size, shape, color, texture, sound, position, and change (qualitative observations).

2. Classify

a. Compare, sort, and group concrete objects according to two attributes.
b. Arrange objects in sequential order.

3. Measure

a. Use standard (U.S. customary and metric) to estimate and measure mass, length, area, perimeter, volume, and temperature to the nearest whole unit (quantitative observations).

4. Communicate

a. Use drawings, tables, graphs, written and oral language to describe objects and explain ideas and actions.

5. Infer

a. Explain or interpret an observation based on data and prior knowledge.
b. Discriminate between observations and inferences.

6. Predict

a. Use prior knowledge and observations to identify and explain in advance what will happen.
b. Discriminate between inferences and predictions.

B. Inquiry

1. Plan and conduct a simple investigation.

a. Ask a question about objects, organisms, and events in the environment.
b. Plan and conduct a simple investigation that represents a fair test.
c. Select and use appropriate equipment and tools to gather data and extend the senses.

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d. Use data to construct a reasonable explanation.
e. Communicate investigations and explanations.

II. Life Science

Unit of Study: Organisms and Their Environment

A. Characteristics of Organisms

1. Organisms have basic needs and can survive only in environments in which their needs can be met. The world has many different environments, and distinct environments support the life of different types of organisms.

a. Identify the characteristics of different environments, such as forests, wetlands, grasslands, deserts, and in polar, temperate, and tropical regions.
b. Describe the diversity of life forms (vertebrate and invertebrate animals and plants) supported by each environment.
c. Investigate the relationships between the basic needs of different organisms and whether or not a particular environment meets those needs.

2. Organisms have senses that help them detect internal and external cues.

a. Analyze specific behaviors influenced by internal cues (e. g., hunger and thirst).
b. Analyze specific behaviors influenced by external cues in the environment (e. g., temperature, light, and precipitation).
c. Describe how animal sensory organs (including human eye and ear) detect external cues. **(P)**

3. Many characteristics of an organism are inherited from the parents of the organism, but other characteristics result from an individual's interactions with the environment.

a. Identify and describe characteristics and behaviors that are inherited (e.g., color of flowers and animal instincts).
b. Identify and describe characteristics and learned behaviors that enable organisms to survive in their environment (e.g., bear learning to fish).
c. Distinguish major groups of organisms based on significant characteristics (e.g., body covering, number of legs, body parts, type of skeleton).

The term investigate is defined as an opportunity for students to explore questions and develop content knowledge by making observations and inferences, collecting and interpreting data, and drawing tentative conclusions through the use of active learning strategies.

B. Organisms and Their Environments

1. An organism's patterns of behavior are related to the nature of that organism's environment, including the kinds and the numbers of other organisms present, the availability of food and resources, and the physical characteristics of the environment.

a. Describe how animals behave and interact within groups (e.g., schools, flocks, packs, hives, and herds).
b. Describe how animals behave and interact within their environment (living and nonliving).

2. All organisms cause changes in the environment where they live.

a. Describe how organisms may benefit their environment (e.g., earthworms improve the quality of soil, birds disperse seeds).
b. Describe how organisms may harm their environment (e.g., locusts destroy crops, red tides reduce oxygen levels in the ocean).

3. Humans change environments in ways that can be either beneficial or detrimental for themselves and other organisms.

a. Describe changes in the environment caused by humans. **(H)**
b. Infer the impact of agricultural technology (e.g., air/land/ water pollution and improved crop yield) on society and the environment**. (T)**
c. Infer the impact of industrial technologies (e.g., air/land/water pollution and improved standard of living) on society and the environment. **(T)**
d. Relate how human population growth changes the environment. **(P)**

III. Earth Science

Units of Study: Sky Patterns
Weather and Climate

A. Objects in the Sky

1. The sun, moon, and stars and planets, asteroids and comets all have properties, locations, and movements that can be observed and described.

a. State that the sun produces its own light, while the moon reflects light from the sun.
b. Describe the positional relationship between the Earth and the moon and their positional relationship to the sun.
c. Observe and record phase changes of the moon over time.

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d. Observe and recognize the location and apparent movement of constellations throughout the seasons.
e. Compare the properties, locations, and movements of the Earth with other planets.
f. Research and describe the historical/cultural significance of astronomy, such as navigation and exploration. **(P, H, T, N)**
g. Explore and identify careers in space science. **(P)**

2. Objects in the sky have patterns of movement. The sun, for example, appears to move across the sky in the same way every day, but its path changes slowly over the seasons.
a. Model and describe how the Earth's rotation on its axis produces day and night.
b. Model and describe how the tilt of the Earth on its axis and its revolution around the sun produce seasonal changes.
c. Describe how sunrise/sunset patterns change over time.
d. Investigate, describe, and predict the sun's apparent movement related to the shadows of objects throughout the day.
e. Identify safe ways to observe the sun.
f. Research and compare the technology humans have used to measure time throughout history. **(T, H)**

B. Changes in the Earth and Sky

1. Weather changes from day to day and over the seasons.
a. Observe daily and seasonal weather patterns.
b. Describe how clouds form.
c. Record and identify various cloud formations (such as, cirrus, stratus, and cumulus).
d. Predict weather based on observations.
e. Research and describe severe weather phenomena, technological advances, and related safety concerns. **(T, P)**

2. Weather can be described by measurable quantities, such as temperature, wind direction, speed, and precipitation.
a. Measure and collect daily weather data using meteorological tools (such as, Fahrenheit/Celsius thermometer, barometer, weather vane, anemometer, and rain gauge).
b. Interpret weather data from a variety of sources.

The term investigate is defined as an opportunity for students to explore questions and develop content knowledge by making observations and inferences, collecting and interpreting data, and drawing tentative conclusions through the use of active learning strategies.

IV. Physical Science

Units of Study: Electricity and Magnetism
Light and Sound

A. Light and Sound

1. Sound is produced by vibrating objects.

a. Observe and describe sounds (a form of energy) produced by vibrating objects.
b. Investigate and examine how various media (solids, liquids, and gases) transmit sound.
c. Research and describe the development and use of communication tools (e.g., the Morse code, telephone, sonar, musical instruments). **(T)**
d. Plan, design, and create a communication tool. **(T)**

2. The pitch of the sound can be varied by changing the rate of vibration.

a. Investigate and compare the different pitches of sound produced by changing the size, tension, or amount of the vibrating material.
b. Compare different types of sounds based on characteristics such as pitch and volume.
c. Describe how the human ear receives and transmits sound from the environment.

3. Light travels in a straight line until it strikes an object.

a. Observe and demonstrate that light waves travel in a straight line.
b. Investigate and examine how light waves travel through various media (solids, liquids, and gases).
c. Investigate and describe ways that light can be reflected, refracted, or absorbed by an object.
d. Describe how the human eye receives and transmits light from the environment.
e. Research, investigate and describe the development and use of optical tools, such as eyeglasses, magnifying lens, prisms, and mirrors. **(T, H, N, P)**

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B. Electricity and Magnetism

1. Electricity in circuits can produce light, heat, sound, and magnetic effect.

a. Recognize that electricity is a form of energy and can produce light and heat.
b. Demonstrate and distinguish between static and current electricity.
c. Describe and illustrate with symbols the parts of an electrical circuit.
d. Predict and test various materials to identify conductors and insulators.
e. Distinguish between open and closed circuits.
f. Distinguish between parallel/series circuits and their everyday uses.
g. Describe how humans use electricity. **(P)**
h. Discuss the safe use of electricity. **(P)**

2. Magnets attract and repel each other and certain kinds of other materials.

a. Distinguish and describe objects that are magnetic and nonmagnetic.
b. Investigate and describe the properties of different magnets.
c. Observe and describe the magnetic fields of various types of magnets.
d. Distinguish the lines of force between like and unlike poles.
e. Define electromagnetism.
f. Analyze the factors that influence the strength of an electromagnet.
g. Apply electromagnetism to real world situations. **(T, P)**

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I. Inquiry

Process skills and inquiries are not an isolated unit of instruction and should be embedded throughout the content areas. Safety issues should be addressed as developmentally appropriate.

A. Process Skills

1. Observe

a. Use the senses and simple tools to gather information about objects or events such as size, shape, color, texture, sound, position, and change (qualitative observations).

2. Classify

a. Compare, sort, and group concrete objects according to two attributes.
b. Arrange objects in sequential order.

3. Measure

a. Use standard (U.S. customary and metric) to estimate and measure mass, length, area, perimeter, volume, and temperature to the nearest whole unit (quantitative observations).

4. Communicate

a. Use drawings, tables, graphs, written and oral language to describe objects and explain ideas and actions.

5. Infer

a. Explain or interpret an observation based on data and prior knowledge.
b. Discriminate between observations and inferences.

6. Predict

a. Use prior knowledge and observations to identify and explain in advance what will happen.
b. Discriminate between inferences and predictions.

7. Hypothesize

a. Devise a statement of assumption, based on observations, experiences, and research, that can be supported or refuted through experimentation.

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8. Define variables

a. Identify independent (manipulated), dependent (responding), and controlled variables in an experiment.

B. Inquiry

1. Plan and conduct a simple investigation.

a. Identify questions that can be answered through scientific investigations.
b. Design and conduct a scientific investigation.
c. Use appropriate tools and techniques to gather, analyze, and interpret data.
d. Develop descriptions, explanations, predictions, and models using evidence.
e. Use mathematical thinking in all aspects of scientific inquiry.
f. Communicate outcomes and explanations.

C. **Abilities Necessary to Do Technological Design**

1. Identify appropriate problems for technological design.

a. Identify a specific need for a product.
b. Determine whether the product will meet that identified need.

2. Design a solution or product.

a. Compare and contrast different proposals using selected criteria (e.g., cost, time, trade-off, and materials needed).
b. Communicate ideas with drawings and simple models.

II. Life Science

Units of Study: Cells and Systems
Ecosystems (Aquatic/Terrestrial)

A. Structure and Function in Living Systems

1. All organisms are composed of cells, the fundamental unit of life. Most organisms are single cells. Other organisms, including humans, are multicellular.

a. Recognize that animals and plants are made of cells.
b. Observe, identify, and distinguish among plant and animal cell parts: nucleus, cytoplasm, vacuole, cell membrane, cell wall and chloroplasts.

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2. The human organism has systems for respiration and circulation. These systems interact with each other.

a. Label the parts and distinguish among the functions of the major organs of the respiratory system, including nose/mouth, larynx, trachea, bronchi, alveoli, lungs, diaphragm.

b. Label the parts and distinguish among the function of the major organs of the circulatory system including heart, arteries, veins, capillaries, and blood cells.

c. Describe how the respiratory and circulatory systems work together to carry gases to and from the body.

3. Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system (respiratory and circulatory).

a. Identify common diseases associated with the respiratory system caused by viruses (such as colds, influenza), diseases caused by bacteria (such as pneumonia, and tuberculosis), and diseases caused by substances such as tobacco. **(P)**

b. Identify common intrinsic diseases and disorders associated with the respiratory system such as asthma and with the circulatory system such as leukemia, sickle cell, and heart disease.

B. Populations and Ecosystems

1. A population consists of all individuals of a species that occur together at a given place and time. All populations live together and the physical factors with which they interact compose an ecosystem.

a. Define a population.

b. Investigate and understand how plants and animals in aquatic/terrestrial ecosystems interact with one another and with the nonliving environment.

2. Populations of organisms can be categorized by the function they serve in an ecosystem. Plants and some microorganisms are producers--they make their own food. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food.

a. Distinguish among the roles organisms serve in a food web (producers, decomposers, consumers, prey and predators).

b. Describe an organism by its niche in an ecosystem.

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3. **For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is used by producers through photosynthesis.**
   a. Recognize that energy passes from organism to organism in food webs.
   b. Diagram how energy flows through food webs.

4. **The number of organisms an ecosystem can support depends on the resources available.**
   a. Identify and investigate the abiotic factors in an ecosystem such as quantity of light, air, and water; range of temperature; salinity, water pressure; and soil composition.
   b. Identify and investigate the biotic factors in an ecosystem.
   c. Describe the effect of limiting factors such as food, water, space, and shelter, on a population.
   d. Evaluate the impact of the environment on populations of organisms.
   e. Draw conclusions about the influence of human activity on ecosystems. **(P)**
   f. Discuss ways to minimize the negative impact of technology/industralization on ecosystems and to maximize the positive impact. **(T)**
   g. Explore and identify career opportunities in natural resource/ environmental/marine science. **(P)**

III. Earth Science

Unit of Study: Changes in the Earth's Surface: Landforms and Oceans

A. Structure of the Earth System

1. **Land forms are the result of a combination of constructive and destructive forces.**
   a. Define constructive forces, which include crustal deformation (folding and faulting), volcanic eruptions and deposition of sediment.
   b. Describe how landforms are created as a result of constructive forces.
   c. Locate and describe the characteristics of South Carolina landform regions such as Blue Ridge, Piedmont, Sandhills, Coastal Plains, and Coastal Zone.
   d. Model how constructive forces change the surface of the Earth.
   e. Define destructive forces, which include weathering and erosion.
   f. Describe how landforms change as a result of destructive forces.
   g. Model how destructive forces change the surface of the Earth.
   h. Investigate and describe how the Earth's surface is constantly changing by weathering, erosion, deposition and human impact. **(P)**

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i. Identify technological advances developed as a result of major geological events such as earthquakes. **(T)**
j. Infer how waves, currents, tides, and storms affect the geological features of the ocean shore zone (e.g., beaches, barrier islands, inlets, estuaries, and harbors, etc.)
k. Discuss safety concerns associated with major geological events. **(P)**

2. The ocean floor is a part of the Earth's lithosphere. Lithospheric plates on the ocean floor move.
a. Identify that the lithosphere includes the crust and parts of the upper mantle, and is broken into large sections known as plates.
b. Recognize how plate movement produces volcanoes, earthquakes, and mountains on the ocean floor.
c. Identify and create a model of the geological features of the ocean floor (continental shelf/rise/slope, mid-Atlantic ridges, rifts, and trenches).

3. Water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle."
a. Diagram, label, and describe evaporation, condensation and precipitation as components of the water cycle.
b. Explain how the water cycle affects the salinity of the ocean's water.

4. Gravity is the force that explains the phenomena of the tides.
a. Describe the relationship of the positions of the sun and the moon on the ocean's tides.

IV. Physical Science

Units of Study: Mixtures and Solutions
Forces, Motion, and Design

A. Properties of Matter

1. A mixture of substances often can be separated into the original substances using one or more of the characteristic properties.
a. Distinguish between a mixture and a solution, recognizing that a solution is one type of a mixture.
b. Create and classify mixtures made of two or more substances (solid-solid, solid-liquid, and liquid-liquid).
c. Identify the potential dangers associated with using some mixtures and solutions, such as bleach, ammonia, abrasive powders, etc. **(P)**

d. Design an investigation to separate (filtration, sifting, magnetism, evaporation, and flotation) mixtures based on their different properties.
e. Investigate the effect of temperature changes on the solubility of a substance.

2. Solubility is one characteristic property of a substance.
a. Distinguish various solids (e.g., cornstarch, sugar, salt, baking powder, and flour) based on observed solubility in water.
b. Distinguish between solvent and solute.
c. Investigate the effect of stirring, shaking, and crushing on the rate of dissolving of solutes.
d. Explain the difference between diluted and concentrated solutions.
e. Identify safety concerns on the labels of common household solutions. **(P)**
f. Research and identify common pollutants, and their sources, and infer their impact as they relate to water quality, since water is the universal solvent. **(P, N)**

B. Motions and Forces

1. The motion of an object can be described by its position, direction of motion and speed.
a. Investigate and describe the relative positions and movements of objects using points of reference.
b. Record and graph in metric units the distance vs. time of moving objects.
c. Investigate the variables that affect speed (e.g., ramp height/length/surface, and mass of object).

2. If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another.
a. Distinguish among gravity, friction, magnetism, drag, lift, and thrust.
b. Investigate and describe how forces affect the motion of objects.
c. Analyze a device with parts that move and determine the purpose of each moving part and the overall purpose of the device.
d. Design and construct a device that moves. **(T)**

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I. Inquiry

A. Abilities Necessary to do Scientific Inquiry

1. Identify process skills that can be used in scientific investigations.

a. Observe

1. Observe patterns of objects and events.
2. Distinguish between qualitative and quantitative observations.

b. Classify

1. Arrange data in sequential order.
2. Use scientific (e.g., field guides, charts, periodic tables, etc.) and dichotomous keys for classification.

c. Measure

1. Select and use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches) and units (e.g., meter, liter, Celsius, gram, Newton, second) to measure to the unit required in a particular situation.
2. Select and use appropriate metric prefixes to include milli-, centi-, and kilo-.

d. Infer

1. Make inferences based on observations.

e. Predict

1. Predict the results of actions based on patterns in data and experiences.

2. Design and conduct a scientific investigation.

a. Recognize potential hazards within a scientific investigation and practice appropriate safety procedures.
b. Pose questions and problems to be investigated.
c. Obtain scientific information from a variety of sources (such as Internet, electronic encyclopedias, journals, community resources, etc.).
d. Distinguish and operationally define independent (manipulated) and dependent (responding) variables.
e. Manipulate one variable over time with repeated trials and controlled conditions.

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f. Collect and record data using appropriate metric measurements.
g. Organize data in tables and graphs.
h. Analyze data to construct explanations and draw conclusions.

3. Use appropriate tools and techniques to gather, analyze, and interpret data

a. Select and use appropriate tools and technology (such as calculators, computers, probes, thermometers, balances, spring scales, microscopes, binoculars, and hand lenses) to perform tests, collect data, and display data.
b. Analyze and interpret data using computer hardware and software designed for these purposes.

4. Develop descriptions, explanations, predictions, and models using evidence.

a. Discriminate among observations, inferences, and predictions.
b. Construct and/or use models to carry out/support scientific investigations.

5. Think critically and logically to make relationships between evidence and explanations.

a. Review and summarize data to show cause-effect relationships in experiments.
b. State explanations in terms of independent (manipulated) and dependent (responding) variables.
c. State hypotheses in ways that include the independent (manipulated) and dependent (responding) variables.

6. Recognize and analyze alternative explanations and predictions.

a. Analyze different ideas and explanations to consider alternative ideas.
b. Accept the skepticism of others as part of the scientific process. **(N)**

7. Communicate scientific procedures and explanations.

a. Use drawings and written and oral expression to communicate information.
b. Create drawings, diagrams, charts, tables and graphs to communicate data.

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c. Interpret and describe patterns of data on drawings, diagrams, charts, tables, graphs, and maps.
d. Create and/or use scientific models to communicate information.

8. Use mathematics in all aspects of scientific inquiry.

a. Use mathematics to gather, organize and present data.
b. Use mathematics to structure convincing explanations.

B. Abilities Necessary to Do Technological Design

1. Identify appropriate problems for technological design.

a. Identify a specific need for a product.
b. Determine whether the product will meet the identified need.

2. Design a solution or product.

a. Compare and contrast different proposals using selected criteria (e.g., cost, time, trade-off, and materials needed).
b. Communicate ideas with drawings and simple models.

3. Implement a proposed design.

a. Select suitable tools and techniques to ensure adequate accuracy.
b. Organize materials, devise a plan and work collaboratively where appropriate.

4. Evaluate completed technological designs or products.

a. Measure the quality of the product based on the original purpose or need and the degree to which it meets the needs of the users.
b. Suggest improvements and try proposed modifications to the design.

5. Communicate the process of technological design.

a. Identify the four stages of problem solving: problem identification, solution design, implementation, and evaluation.

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C. Understandings about Science and Technology

1. Scientific inquiry and technological design have similarities and differences.

a. Compare and contrast scientific inquiry and technological design.

2. Many different people in different cultures have made and continue to make contributions to science and technology.

a. Describe examples of contributions people have made to science and technology. **(H, N)**

3. Science and technology are reciprocal.

a. Explain how science and technology are essential to each other. **(T)**

4. Perfectly designed solutions do not exist.

a. Discuss factors that affect product design and alter the original design. **(T)**
b. Discuss risk versus benefit factors in product design. **(P)**

5. Technological designs have constraints.

a. Describe examples of constraints on technological designs. **(T)**
b. Explain why constraints on technological design are unavoidable. **(T, N)**

6. Technological solutions have intended benefits and unintended consequences.

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II. Life Science

Unit of Study: Fungi and Plants

A. Structure and Function in Fungi and Plant Systems

1. Important levels of organization for structure and function include cells and whole organisms. All organisms are composed of cells — the fundamental unit of life.

a. Identify and explain the function of plant cell parts (e.g., vacuoles, nucleus, cytoplasm, cell membrane, cell wall, and chloroplasts).
b. Distinguish between and illustrate plant and animal cells (e.g., cell wall, chloroplasts, and nucleus).
c. Describe the basic characteristics of two of the kingdoms of organisms--fungi and plants.
d. Compare and contrast three forms of fungi (mushrooms, yeasts and molds).
e. Compare and contrast vascular and nonvascular plants, flowering and non-flowering plants and deciduous and coniferous trees.

2. Some diseases are the result of damage by infection by other organisms.

a. Describe the helpful and harmful effects of some fungi on other organisms (e.g., athlete's foot and ringworm in humans, rust in plants, penicillin). **(P)**

B. Plant Reproduction and Heredity

1. Reproduction is a characteristic of all living systems, because no individual organism lives forever, reproduction is essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.

a. Describe asexual reproduction processes in plants and fungi (e.g., vegetative propagation in stems, roots, and leaves of plants; budding in yeasts; fruiting bodies in fungi).
b. Identify the process of cell division as asexual reproduction.
c. Identify where sexual spores are produced on mushrooms and explain how the spores are dispersed.

2. Plants also reproduce sexually — the egg and sperm are produced in the flowers of flowering plants.

a. Observe, draw, and label the parts of a flower and examine their functions in sexual reproduction.
b. Describe the importance of wind, water, or insects to the pollination process and the adaptations of flowering plants to ensure pollination.
c. Discuss the negative impacts of pesticides on the pollination process. **(P)**

3. An egg and sperm unite to begin the development of a new individual.

a. Trace the path of the sperm cells to the egg cell in the ovary of a flower to produce a seed.
b. Analyze the structures and functions of parts of a seed in the formation of a plant.
c. Investigate and describe the conditions necessary for the germination of seeds.
d. Analyze the structures and functions of fruits in the reproduction of seed plants.

C. Regulation and Behavior

1. All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.

a. Describe the most effective conditions for the growth of fungi and their adaptations to those conditions.
b. Describe how green plants absorb energy from the sun and transform it into stored chemical energy using the terms photosynthesis, chlorophyll, water, carbon dioxide, oxygen and sugar.
c. Describe how plants break down sugar to release stored chemical energy through respiration.
d. Explain the importance of green plants to the survival of other organisms in the environment.
e. Relate the structures of roots, stems and leaves to their functions in plants.
f. Observe, draw, and analyze the structure and function of xylem and phloem tissues in roots and stems of vascular plants.
g. Identify guard cells and explain their function in the operation of stomata (transpiration).

h. Examine why stomata in most plants are closed at night and open during the day.

2. Behavior is one kind of response an organism can make to an internal or environmental stimulus.

a. Define tropisms in plants.
b. Apply tropisms in plants in response to specific stimuli (e.g., light, gravity, touch, and water) to real world situations.

3. An organism's behavior evolves through adaptation to its environment.

a. Explain the importance of fungi as decomposers and their adaptations to that role.
b. Compare and contrast the major characteristics of land biomes (e.g., Tropical rainforests, Temperate rainforests, deserts, tundra, coniferous forests/taiga, and deciduous forests).
c. Distinguish adaptations of various plants to survive and reproduce in different biomes.

Unit of Study: Muscular and Skeletal Systems

D. Structure and Function in Muscular and Skeletal Systems

1. The human organism has muscular and skeletal systems for movement.

a. Illustrate the parts and describe the functions of the skeletal and muscular systems including bones, muscles, ligaments, joints, and tendons.

2. Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system.

a. Identify the diseases of the muscular and skeletal systems that are the result of intrinsic factors (e.g., muscular dystrophy and arthritis).

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III. Earth Science

Unit of Study: Energy Transfer in the Atmosphere

A. Structure of the Earth System

1. Water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the Earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow and falls to the surface, where it collects in lakes, oceans, soil, and rocks underground.

a. Identify, investigate and explain the processes of condensation, evaporation, precipitation, and runoff using a model or diagram.
b. Relate the occurrence of water in the Earth's crust, oceans, and atmosphere to the water cycle processes.
c. Analyze why precipitation occurs in the form of rain, sleet, hail, or snow.

2. Water is a solvent. As it passes through the water cycle, it dissolves minerals and gases and carries them to the oceans.

a. Classify different substances based on their solubility in water.
b. Infer the effects of water on the weathering of the Earth's surface in terms of solubility.
c. Describe how minerals (and salts) accumulate in lakes and oceans. [Concept has been taught at a previous grade level]
d. Explain how acid rain forms from gases (carbon dioxide, sulfur and nitrogen oxides from burning fossil fuels) dissolved in the water in the atmosphere.

3. The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor.

a. Identify the gas composition of the atmosphere.
b. Operationally define humidity and relative humidity and relate these to weather conditions.

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4. The atmosphere has different properties at different elevations.

a. Compare and contrast the physical characteristics of the different layers of the atmosphere (e.g., troposphere, stratosphere, mesosphere, thermosphere, exosphere).
b. Relate the characteristics of the layers of the atmosphere (e.g., temperature, pressure, composition of gases) to different altitudes.
c. Explain the effect of air pressure at different elevations (e.g., effects on cooking, on our ears popping).

5. Clouds, formed by the condensation of water vapor, affect weather and climate.

a. Demonstrate and explain the formation of clouds.
b. Classify shapes and types of clouds according to elevation.
c. Relate cloud types to weather events and patterns.
d. Use weather maps, Internet sites with satellite images, and other weather data to identify and predict weather conditions.

6. Global patterns of atmospheric movement influence local weather.

a. Relate heat transfer to the movement of air masses, high and low pressure areas, and fronts in the atmosphere.
b. Compare characteristics and locations of global wind patterns (e.g., trade winds and the jet stream), and give examples of how these global patterns can affect local weather.
c. Describe how satellites and computers provide information on local and worldwide weather patterns. **(T)**

7. Oceans have a major effect on climate, because water in the oceans holds a large amount of heat.

a. Relate heat transfer to the circulation of ocean currents.
b. Compare the characteristics of the Gulf Stream with other large ocean currents and their effects on climate in Eastern North America and Western Europe.
c. Infer why air temperatures are more moderate in areas near large bodies of water.
d. Describe where hurricanes form and their movement across the oceans.
e. Describe what happens when hurricanes move over land.

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IV. Physical Science

Unit of Study: Physical Properties and Changes of Matter

A. Properties and Changes of Properties in Matter

1. A substance has characteristic properties, such as density, boiling point, and solubility, all of which are independent of the amount of the sample.

a. Investigate the direct relationship between the amount of water an object displaces and the object's volume.
b. Relate the properties of sinking and floating to different densities of substances (hydrometer).
c. Determine mass and volume of various substances and calculate their densities as mass/volume.
d. Define and give examples of the three states of matter. Introduce plasma (e.g., lightning and material in neon lights) as a fourth state of matter.
e. Apply properties of different densities to oil spill pollution problems and life in frozen lakes and to other real world situations.
f. Classify substances based on melting points, boiling points, and solubility data.
g. Investigate and describe how solubility differences can be used to identify components of a mixture (e.g., chromatography).

2. Substances often are placed in categories or groups if they react in similar ways; metals are an example of such a group.

a. Distinguish among elements, compounds, and mixtures.
b. Use the periodic table to identify common elements in their groups.
c. Distinguish metals from non-metals based on observed characteristics.
d. Create models of atoms representing common elements by identifying the location and charges of the protons, neutrons, and electrons in the models.
e. Distinguish between acids and bases using indicators.
f. Relate the pH scale to the colors of indicators and relative strengths of acids and bases.

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3. There are more than 100 known elements that combine in a multitude of ways to produce compounds, which account for the living and nonliving substances that we encounter.

a. List the most common elements and compounds found in living organisms.
b. Interpret labels on foods, household chemicals, and over-the-counter medicines to identify common elements and compounds present.

Unit of Study: Machines and Work

B. Motion and Forces

1. Motion can be measured and represented on a graph.

a. Measure force required to move an object using appropriate devices (e.g., spring scale, rubber band, ruler).
b. Manipulate and graph force vs. distance required to move an object using a lever, pulley, or inclined plane without changing the total work involved.

2. If more than one force acts on an object along a straight line, then the forces will reinforce or cancel one another, depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.

a. Construct and analyze simple machines (e.g., levers, pulleys, and inclined planes) to analyze forces and distances (i.e., work).
b. Investigate how using simple machines can reduce the force (effort) required to do the same amount of work done without a machine by increasing the distance required to move the object.
c. Demonstrate the change in direction of an object's motion using a machine or by interpreting diagrams or descriptions.
d. Describe the effect of friction on an object by using different surfaces on an inclined plane or by interpreting diagrams or descriptions.
e. Investigate how machines can reduce the effect of the forces of friction and gravity.

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Unit of Study: Forms and Transfer of Energy

C. Energy is transferred in many ways.

1. Energy is a property of many substances and is associated with heat, light, electricity, mechanical motion, sound, and the nature of a chemical.

a. Identify sources of heat, light, sound, electrical and chemical energy, and mechanical motion.
b. Recognize and identify heat, light, sound, electrical and chemical energy, and mechanical motion as forms of energy.

2. Energy is transferred in many ways.

a. Demonstrate how mechanical energy is transformed to another form of energy (e.g., vibrations, heat through friction).
b. Demonstrate how chemical energy is transformed to another form of energy (e.g., light wands, lightning bugs, batteries, and bulbs).

3. Heat moves in predictable ways, flowing from warmer to cooler objects, until both reach the same temperature.

a. Predict and demonstrate the effect of the flow of heat in solids, liquids, and gases.
b. Investigate the effects of temperature differences on the movement of water.
c. Design an experiment that reduces the rate at which a substance melts.
d. Observe and compare the melting time of a substance in an insulated container vs. an open container.
e. Analyze how insulating factors affect the flow of heat.
f. Relate insulating factors to real life applications (e.g., building construction, clothing, animal covering).
g. Analyze and use examples to show how conduction, convection, or radiation factors enhance the flow of heat.

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4. Electrical circuits provide a means of transferring electrical energy when heat, light, sound, and chemical changes are produced. Heat, light, mechanical motion, or electricity might be involved in such transfers.

a. Design and diagram, using common pictures and symbols, an electrical circuit to demonstrate energy transfer.
b. Relate electricity to magnetism (e.g., electromagnets and simple electric motors) using descriptions and diagrams.
c. Analyze how an electric motor demonstrates energy transfers (e.g., chemical to electrical to mechanical motion).
d. Explain how generators produce electricity from mechanical motion.

5. The sun is a major source of energy for changes on the Earth's surface.

a. Measure temperature differences as the sun or a model of the sun warms different surfaces.
b. Graph time vs. temperature of different surfaces exposed to the sun and analyze the graphs to infer factors that affect heat absorption.
c. Investigate and describe practical uses of solar energy (e.g., solar ovens, water heaters, calculators, etc.).

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I. Inquiry

A. Abilities Necessary to do Scientific Inquiry

1. Identify process skills that can be used in scientific investigations.

a. Observe

1. Observe patterns of objects and events.
2. Distinguish between qualitative and quantitative observations.

b. Classify

1. Arrange data in sequential order.
2. Use scientific (e.g., field guides, charts, periodic tables, etc.) and dichotomous keys for classification.

c. Measure

1. Select and use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, stopwatches) and units (e.g., meter, liter, Celsius, gram, Newton, second) to measure to the unit required in a particular situation.
2. Select and use appropriate metric prefixes to include milli-, centi-, and kilo-.

d. Infer

1. Make inferences based on observations.

e. Predict

1. Predict the results of actions based on patterns in data and experiences.

2. Design and conduct a scientific investigation.

a. Recognize potential hazards within a scientific investigation and practice appropriate safety procedures.
b. Pose questions and problems to be investigated.
c. Obtain scientific information from a variety of sources (such as Internet, electronic encyclopedias, journals, community resources, etc.).
d. Distinguish and operationally define independent (manipulated) and dependent (responding) variables.
e. Manipulate one variable over time with repeated trials and controlled conditions.
f. Collect and record data using appropriate metric measurements.

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g. Organize data in tables and graphs.
h. Analyze data to construct explanations and draw conclusions.

3. Use appropriate tools and techniques to gather, analyze, and interpret data.

a. Select and use appropriate tools and technology (such as calculators, computers, probes, thermometers, balances, spring scales, microscopes, binoculars, and hand lenses) to perform tests, collect data, and display data.
b. Analyze and interpret data using computer hardware and software designed for these purposes.

4. Develop descriptions, explanations, predictions, and models using evidence.

a. Discriminate among observations, inferences, and predictions.
b. Construct and/or use models to carry out/support scientific investigations.

5. Think critically and logically to make relationships between evidence and explanations.

a. Review and summarize data to show cause-effect relationships in experiments.
b. State explanations in terms of independent (manipulated) and dependent (responding) variables.
c. State hypotheses in ways that include the independent (manipulated) and dependent (responding) variables.

6. Recognize and analyze alternative explanations and predictions.

a. Analyze different ideas and explanations to consider alternative ideas.
b. Accept the skepticism of others as part of the scientific process.

7. Communicate scientific procedures and explanations.

a. Use drawings, written and oral expression to communicate information.
b. Create drawings, diagrams, charts, tables, and graphs to communicate data.
c. Interpret and describe patterns of data on drawings, diagrams, charts, tables, graphs, and maps.
d. Create and/or use scientific models to communicate information.

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8. Use mathematics in all aspects of scientific inquiry.

a. Use mathematics to gather, organize, and present data.
b. Use mathematics to structure convincing explanations.

B. Abilities Necessary to Do Technological Design

1. Identify appropriate problems for technological design.

a. Identify a specific need for a product.
b. Determine whether the product will meet the specified need.

2. Design a solution or product.

a. Compare and contrast different proposals using selected criteria (e.g., cost, time, trade-off, materials needed).
b. Communicate ideas with drawings and simple models.

3. Implement a proposed design.

a. Select suitable tools and techniques to ensure adequate accuracy.
b. Organize materials, devise a plan, and work collaboratively where appropriate.

4. Evaluate completed technological designs or products.

a. Measure the quality of the product based on the original purpose or need and the degree to which it meets the needs of the users.
b. Suggest improvements and try proposed modifications to the design.

5. Communicate the process of technological design.

a. Identify the four stages of problem solving: problem identification, solution design, implementation, and evaluation.

C. Understandings about Science and Technology

1. Scientific inquiry and technological design have similarities and differences.

a. Compare and contrast scientific inquiry and technological design.

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2. Many different people in different cultures have made and continue to make contributions to science and technology.

a. Describe examples of contributions people have made to science and technology. **(H, N)**

3. Science and technology are reciprocal.

a. Explain how science and technology are essential to each other. **(T)**

4. Perfectly designed solutions do not exist.

a. Discuss factors that affect product design and alter the original design. **(T)**
b. Discuss risk versus benefit factors in product design. **(P)**

5. Technological designs have constraints.

a. Describe examples of constraints on technological designs. **(T)**
b. Explain why constraints on technological design are unavoidable. **(T, N)**

6. Technological solutions have intended benefits and unintended consequences.

II. Life Science

Unit of Study: Organization and Classification of Living Things

A. Structure and Function in Living Systems

1. All organisms are composed of cells — the fundamental unit of life. Most organisms are single cells; other organisms, including humans, are multicellular.

a. Explain why the cell is the most basic unit of living things.
b. Classify organisms as single-celled (e.g., bacteria, algae, protozoa, and certain fungi) or multicellular (e.g., animals [vertebrate/ invertebrate]).
c. Give evidence to support the statement that single-celled organisms comprise the greatest biomass of life on Earth.

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d. Analyze the use of single-celled organisms in industry and in the production of food and problems single-celled organisms can cause for humans. **(T, P)**

2. Cells carry on the many functions needed to sustain life. They grow and divide thereby producing more cells. This requires that they take in nutrients, which they use to provide energy for the work that cells do and to make the materials that a cell or an organism needs.

a. Compare the major components of the cell (nucleus*, cytoplasm*, cell membrane*, cell wall*, vacuole*, mitochondrion, nuclear membrane, and chromosome), and their general functions (e.g., mitochondrion is the site of energy production). [The asterisk indicates that the concept has been taught at a previous grade level]
b. Describe the processes of respiration (aerobic and anaerobic), growth and reproduction (asexual and sexual), removal of wastes, and cellular transport (osmosis and diffusion) in cells.
c. Demonstrate diffusion and osmosis.

3. Living systems at all levels of organization demonstrate the complementary nature of structure and function. Important levels of organization for structure and function include cells, organs, tissues, organ systems, whole organisms, and ecosystems. Specialized cells perform specialized functions in multicellular organisms. Groups of specialized cells cooperate to form a tissue, such as a muscle. Different tissues are in turn grouped together to form larger functional units, called organs. Each type of cell, tissue, and organ has a distinct structure and set of functions that serve the organism as a whole.

a. Compare and contrast the major structures and functions of typical plant and animal cells.*
b. Observe, compare, and contrast different types of cells and tissues (e.g., epithelial, nerve, bone, blood, and muscle). **(T)**
c. Differentiate among cells, tissues, organs, and organ systems.
d. Compare and contrast the structure and functions of cells, tissues, and organs in single-celled and multicellular organisms.
e. Classify living organisms according to similarities in structure using a dichotomous key (kingdom, phylum, class, order, family, genus, and species).

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4. The human organism has systems for digestion, respiration*, circulation*, excretion, movement*, control, and coordination*, and protection from disease. These systems interact with one another. [The asterisk indicates that the concept has been taught at a previous grade level]

a. Identify the general functions of the major body systems and give examples of how these systems work together (e.g., respiratory and circulatory).
b. Explain how the nervous and endocrine systems are regulators of activities in humans.
c. Define regulation as the process of monitoring and coordinating activities in an organism.
d. Illustrate the parts and describe the functions of the organs of the nervous system (e.g., parts of the brain, the spinal cord, and nerves).
e. Illustrate the parts and describe the functions of the glands of the endocrine system (e.g., pituitary, thyroid, adrenal glands, and pancreas).
f. Illustrate the parts and describe the functions of the digestive system including mouth, esophagus, stomach, small intestine, large intestine, rectum, liver, pancreas, and gall bladder.
g. Design an appropriate diet and describe the effects and benefits on body functions. **(P)**
h. Illustrate the parts and describe the functions of the organs of the excretory system including kidneys, liver, and urinary bladder.
i. Compare and contrast the human body organs and systems to other animals (e.g., earthworm, frog, and chicken).

5. Disease is a breakdown in structures or functions of an organism. Some diseases are the result of intrinsic failures of the system. Others are the result of damage by infection by other organisms.

a. Describe the work of scientists (e.g., Pasteur, Fleming, Salk) in the discovery and prevention of disease. **(H)**
b. Differentiate among a virus, a bacterium, and a protist.
c. List common diseases caused by viruses (e.g., polio, measles, smallpox), bacteria (e.g., tetanus, strep throat), and protists (e.g., malaria).
d. Identify the intrinsic diseases associated with the digestive system (e.g., Crohn's disease), and the nervous and endocrine systems (e.g., diabetes and Parkinson's disease).

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e. Examine how health care technology has improved the quality of human life (e.g., computerized tomography [CT], artificial organs, bionics, magnetic resonance imaging [MRI], ultrasound). **(T)**

B. Regulation and Behavior

1. All organisms must be able to obtain and use resources, grow, reproduce, and maintain stable internal conditions while living in a constantly changing external environment.

a. Analyze the basic characteristics and needs of living things.
b. Compare and contrast how organisms use resources, grow, reproduce, and maintain stable internal conditions (homeostasis).

2. Regulation of an organisms internal environment involves sensing the internal environment and changing physiological activities to keep conditions within the range required to survive.

a. Contrast warm-blooded and cold-blooded animals' mechanisms to control their internal environment.
b. Infer how environmental stimuli cause changes in hormone production that allow organisms to survive (e.g., adrenaline is produced in response to fear or excitement).

3. Behavior is one kind of response an organism can make to an internal or environmental stimulus. A behavioral response requires coordination and communication at many levels, including cells, organ systems, and whole organisms. Behavioral response is a set of actions determined in part by heredity and in part from experience.

a. Evaluate behaviors to determine if they are inherited or learned.
b. Predict an organism's response to an environmental stimulus based on its level of organization (e.g., endospore formation, and hibernation).

Unit of Study: Genetics

C. Reproduction and Heredity

1. Reproduction is a characteristic of all living systems and essential to the continuation of every species. Some organisms reproduce asexually. Other organisms reproduce sexually.

a. Compare and contrast sexual and asexual reproduction.

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b. Account for the adaptability of species that reproduce sexually versus asexually.

2. In many species, females produce eggs and males produce sperm. An egg and a sperm unite to begin the development of a new individual. That new individual receives genetic information from its mother (via the egg) and its father (via the sperm). Sexually produced offspring never are identical to either of their parents.

a. Explain the formation of sex cells (meiosis) and the waythis results in each cell having only half the genetic material needed to produce a new individual.
b. Analyze how the combination of sex cells results in a new combination of genetic information different from either parent.

3. Every organism requires a set of instructions for specifying its traits. Heredity is the passage of these instructions from one generation to another. Hereditary information is contained in genes, located in the chromosomes of each cell. Each gene carries a single unit of information. An inherited trait of an individual can be determined by one or by many genes, and a single gene can influence more than one trait. A human cell contains many thousands of different genes.

a. Identify the historical contributions and significance of discoveries of Gregor Mendel as related to genetics. **(H)**
b. Describe the relationship between genes and chromosomes and their relationship to inherited characteristics.
c. Analyze how traits are passed from parents to offspring through pairs of genes.
d. Explain how inherited traits are determined by one or many genes.

4. The characteristics of an organism can be described in terms of a combination of traits. Some traits are inherited and others result from interactions with the environment.

a. Differentiate between dominant and recessive traits (genotypes and phenotypes).
b. Categorize traits as inherited or acquired.
c. Construct and use Punnett squares to explain how single genetic traits are combined and passed to offspring.
d. Calculate the probability of simple phenotypes and genotypes.
e. Discuss advantages and disadvantages of selective breeding, genetic engineering, and biomedical research. **(P)**

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Unit of Study: Ecology — The Biotic Environment

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D. Populations and Ecosystems

1. A population consists of all individuals of a species that occur together at a given place and time. All populations living together and the physical factors with which they interact compose an ecosystem.

a. Describe the characteristics of populations. [The asterisk indicates that this concept has been taught at a previous grade level]
b. Distinguish between populations and communities.
c. Distinguish between habitats and niches.
d. Differentiate between an ecosystem and a biome.

2. Populations of organisms can be categorized by the function they serve in an ecosystem. All animals, including humans, are consumers, which obtain food by eating other organisms. Decomposers, primarily bacteria and fungi, are consumers that use waste materials and dead organisms for food. Food webs identify the relationships among producers, consumers, and decomposers in an ecosystem.

a. Analyze the role of producers, consumers and decomposers in an ecosystem.
b. Identify kinds of relationships organisms have with each other (predator/prey, competition).
c. Analyze energy flow in a food chain and its relationship to a food web.

3. The number of organisms an ecosystem can support depends on the biotic resources available. Given adequate biotic resources and no disease or predators, populations (including humans) increase at rapid rates. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

a. Compare and contrast how cooperation, competition and predation affect population growth.
b. Analyze the effects of overpopulation within an ecosystem on the amount of resources available. **(P)**
c. Analyze how natural hazards (earthquakes, landslides, wildfires, volcanic eruptions, floods, and storms) affect populations. **(P)**

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III. Earth Science

Unit of Study: Ecology — The Abiotic Environment

A. Structure of the Earth System

1. Landforms are the result of a combination of constructive forces (e.g., deposition of sediments) and destructive forces (e.g., weathering and erosion).

a. Distinguish among weathering, erosion, and deposition.
b. Examine how physical weathering and chemical weathering break rocks into fragments.
c. Investigate and examine how the earth's surface is constantly changed by weathering, erosion, deposition and human impact. **(P)**
d. Examine the effects of weathering, erosion, and deposition on the formation of major landform regions in South Carolina.
e. Relate the fertility of floodplains to deposition of sediments.
f. Discuss the benefits and hazards of living on a floodplain. **(P)**

2. Soil consists of weathered rocks and decomposed organic material from dead plants, animals, and bacteria. Soils are often found in layers, with each having a different chemical composition. Living organisms have played many roles in the Earth system, including affecting the composition of the atmosphere, producing some types of rocks, and contributing to the weathering of rocks.

a. Discuss how climatic conditions affect the development of soils.
b. Analyze soil properties that can be observed (soil profile, composition, texture, particle size) and measured (permeability, temperature, pH, moisture) to predict soil quality.
c. Explain why soil (sediments) can be a major pollutant of streams. **(P)**
d. Evaluate ways in which human activities have affected soil and the measures taken to control the impact (silt fences, ground cover, farming, land use, nutrient balance). **(P)**

3. Water, which covers the majority of the Earth's surface, circulates through the crust, oceans, and atmosphere in what is known as the "water cycle." Water evaporates from the Earth's surface, rises and cools as it moves to higher elevations, condenses as rain or snow, and falls to the surface where it collects in lakes, oceans, soil, and in rocks underground.

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a. Define groundwater, runoff, drainage divide and drainage basin (watershed).
b. Infer what happens to water that does not soak into the ground or evaporate.
c. Analyze the factors that affect runoff.
d. Differentiate between drainage divides and drainage basins using maps or aerial photography and illustrate the relationships between groundwater and surface water in a watershed. **(T)**
e. Identify and illustrate groundwater zones including water table, zone of saturation, and zone of aeration.
f. Identify technologies designed to reduce sources of point and non-point water pollution. **(T, P)**

4. The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor.

a. Infer how air pollution affects people and the environment.
b. Infer how air pollution affects the human body.
c. Analyze ways air pollution can be reduced.
d. Analyze how chemical hazards (pollutants in air, water, soil, and food) affect populations and ecological succession. **(P)**

5. The sun is a major source of energy for changes on the Earth's surface. Energy is transferred in many ways.

a. Analyze the greenhouse effect and its consequences. **(P)**
b. Describe ways that humans may be influencing or contributing to global warming. **(P)**

6. For ecosystems, the major source of energy is sunlight. Energy entering ecosystems as sunlight is transferred by producers into chemical energy through photosynthesis. That energy then passes from organism to organism in food webs.

a. Describe how sunlight, through photosynthesis, is transferred by producers into chemical energy.
b. Trace the path of solar energy through a simple food chain and through food webs that include humans.
c. Examine how energy is transferred through an ecosystem.
d. Examine how energy is distributed in an energy pyramid.

7. The number of organisms an ecosystem can support depends upon the abiotic factors. Given adequate abiotic resources and no disease or

predators, populations (including humans) increase at a rapid rate. Lack of resources and other factors, such as predation and climate, limit the growth of populations in specific niches in the ecosystem.

a. Compare and contrast the abiotic factors that affect population growth and size (quantity of light, water, range of temperatures, soil compositions).
b. Diagram the cycles of water, carbon, oxygen, and nitrogen in the environment.
c. Analyze the vital role of single-celled organisms (e.g., phytoplankton) in the carbon, oxygen cycles.
d. Examine how materials are reused in a continuous cycle in ecosystems.
e. Distinguish between renewable and nonrenewable resources and examine the importance of their conservation. **(P)**
f. Evaluate the effects of human population on air, water, and land. **(P)**
g. Analyze the benefits of solid waste management (reduce, reuse, recycle). **(T, P)**

IV. Physical Science

Unit of Study: Chemical Nature of Matter

A. Properties and Changes of Properties in Matter

1. Chemical elements do not break down during normal laboratory reactions involving such treatments as heating, exposure to electric current, or reaction with acids. Substances react chemically in characteristic ways with other substances to form new substances (compounds) with different characteristic properties.

a. Distinguish between physical and chemical properties.
b. Distinguish between physical and chemical changes.
c. Cite examples of chemical changes in matter (e.g., rusting [slow oxidation], combustion [fast oxidation], and food spoilage).

2. In chemical reactions, the total mass is conserved.

a. Recognize chemical symbols and chemical formulas of common substances such as NaCl (table salt), H_20 (water), $C_6H_{12}O_6$ (sugar), O_2 (oxygen gas), CO_2 (carbon dioxide), and N_2 (nitrogen gas).
b. Identify evidences of chemical reactions (e.g., gas evolved, color and/or temperature change, precipitate formed).

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c. Determine the reactants and products in simple chemical reactions such as photosynthesis (plants) and respiration (plants and animals).
d. Explain the role of the enzymes as catalysts.
e. Use balanced chemical equations such as photosynthesis and respiration to support the law of conservation of matter.
f. Explain how the total mass of matter involved in the chemical reaction does not change even when a gas is released.

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1. Select and use appropriate tools (e.g., metric ruler, graduated cylinder, thermometer, balances, spring scales, and stopwatches) and units (e.g., meter, liter, Celsius, gram, Newton, and second) to measure to the unit required in a particular situation.
2. Select and use appropriate metric prefixes to include milli-, centi-, and kilo-.

d. Infer

1. Make inferences based on observations.

e. Predict

1. Predict the results of actions based on patterns in data and experiences.

2. Design and conduct a scientific investigation.

a. Recognize potential hazards within a scientific investigation and practice appropriate safety procedures.
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g. Organize data in tables and graphs.
h. Analyze data to construct explanations and draw conclusions.

3. Use appropriate tools and techniques to gather, analyze, and interpret data.

a. Select and use appropriate tools and technology (such as calculators, computers, probes, thermometers, balances, spring scales, microscopes, binoculars, and hand lenses) to perform tests, collect data, and display data.
b. Analyze and interpret data using computer hardware and software designed for these purposes.

4. Develop descriptions, explanations, predictions, and models using evidence.

a. Discriminate among observations, inferences, and predictions.
b. Construct and/or use models to carry out/support scientific investigations.

5. Think critically and logically to make relationships between evidence and explanations.

a. Review and summarize data to show cause-effect relationships in experiments.
b. State explanations in terms of independent (manipulated) and dependent (responding) variables.
c. State hypotheses in ways that include the independent (manipulated) and dependent (responding) variables.

6. Recognize and analyze alternative explanations and predictions.

7. Communicate scientific procedures and explanations.

a. Use drawings, written and oral expression to communicate information.
b. Create drawings, diagrams, charts, tables, and graphs to communicate data.
c. Interpret and describe patterns of data on drawings, diagrams, charts, tables, graphs, and maps.
d. Create and/or use scientific models to communicate information.

8. Use mathematics in all aspects of scientific inquiry.

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a. Use mathematics to gather, organize, and present data.
b. Use mathematics to structure convincing explanations.

B. Understandings about Scientific Inquiry

1. Different kinds of questions suggest different kinds of scientific investigations.

a. Relate how the kind of question being asked directs the type of investigation conducted (e.g., observing and describing, collecting, experimenting, surveying, inventing, and making models).

2. Current scientific knowledge and understanding guide scientific investigations.

3. Mathematics is important in all aspects of scientific inquiry.

4. Technology used to gather data enhances accuracy and allows scientists to analyze and quantify results.

a. Compare and contrast the quality of data collected with and without technological devices.

5. Scientific explanations emphasize evidence, have logically consistent arguments and use scientific principles, models and theories.

a. Discuss how scientific knowledge advances when new scientific explanations displace previously accepted knowledge.

6. Science advances through legitimate skepticism.

7. Scientific investigations sometimes result in new ideas and phenomena for study.

C. Abilities Necessary to Do Technological Design

1. Identify appropriate problems for technological design.

a. Identify a specific need for a product.
b. Determine whether the product will meet the needs and be used.

The term investigate is defined as an opportunity for students to explore questions and develop content knowledge by making observations and inferences, collecting and interpreting data, and drawing tentative conclusions through the use of active learning strategies.

2. Design a solution or product.

a. Compare and contrast different proposals using selected criteria (e.g., cost, time, trade-off, and materials needed).
b. Communicate ideas with drawings and simple models.

3. Implement a proposed design.

a. Select suitable tools and techniques to ensure adequate accuracy.
b. Organize materials, devise a plan, and work collaboratively where appropriate.

4. Evaluate completed technological designs or products.

a. Measure the quality of the product based on the original purpose or need and the degree to which it meets the needs of the users.
b. Suggest improvements and try proposed modifications to the design.

5. Communicate the process of technological design.

a. Identify the four stages of problemsolving: problem identification, solution design, implementation, and evaluation.

D. Understandings about Science and Technology

1. Scientific inquiry and technological design have similarities and differences.

a. Compare and contrast scientific inquiry and technological design.

2. Many different people in different cultures have made and continue to make contributions to science and technology.

a. Describe examples of contributions people have made to science and technology. **(H, N)**

3. Science and technology are reciprocal.

a. Explain how science and technology are essential to each other. **(T)**

4. Perfectly designed solutions do not exist.

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a. Discuss factors that affect product design and alter the original design. **(T)**
b. Discuss risk versus benefit factors in product design. **(P)**

5. Technological designs have constraints.

a. Describe examples of constraints on technological designs. **(T)**
b. Explain why constraints on technological design are unavoidable. **(T, N)**

6. Technological solutions have intended benefits and unintended consequences.

II. Life Science

Unit of Study: Classification, Diversity, and Adaptations of Organisms Over Time

A. Diversity and Adaptations of Organisms

1. Millions of species of animals, plants, and microorganisms are alive today. Although different species might look dissimilar, the unity among organisms becomes apparent from an analysis of internal structures, the similarity of their chemical processes and the evidence of common ancestry.

a. Observe, describe, and examine the diversity of organisms over time including differences and similarities based on kingdoms, phyla, classes (e.g., structure, body temperature, size, and shape). *[This concept has been taught at a previous grade level]

2. Biological change accounts for the diversity of species developed through gradual processes over many generations. Biological adaptations, which involve the selection of naturally occurring variations in populations, enhance survival and reproductive success in a particular environment. How a species moves, obtains food, reproduces, and responds to danger is based in the species' evolutionary history.

a. Suggest evidence of how species have adapted to changes in their habitats.

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b. Analyze how an adaptation can increase an organism's chances to survive and reproduce in a particular habitat (e.g., cacti needles/ leaves, fur/scales). *[This concept has been taught at a previous grade level]
c. Examine how natural selection increases the variations within populations.

3. Extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient to allow its survival.

a. Determine the factors that contribute to an organism becoming extinct.
b. Explain some of the natural and human-made pressures that can cause extinction.
c. Examine ways to prevent the extinction of an organism.

4. Fossils provide important evidence of how life and environmental conditions have changed. (Earth's History: Earth Science) Fossils indicate that many organisms that lived long ago are extinct. Extinction of species is common. Most of the species that have lived on the Earth no longer exist.

a. Examine how scientists use fossils as clues to study the Earth's past.
b. Observe, interpret, and analyze fossilized tracks.
c. List different types of fossils and infer how each formed (petrifaction, mold and cast, imprint).
d. Demonstrate how to determine the relative age of rocks and fossils (index fossil, oldest rock layer, and youngest rock layer).
e. Explain how scientists use technology to date rocks and fossils (e.g., radioactive dating). **(T)**

5. The Earth's processes we see today including erosion, movement of lithospheric plates, and changes in atmospheric composition, are similar to those that occurred in the past. Earth's history is also influenced by occasional catastrophes such as the impact of an asteroid or comet.

a. Illustrate the principle of uniformitarianism (the concept that Earth processes over time are consistent).
b. Explain how the geologic time scale is divided into units (e.g., era, period, and epoch).
c. Group different life forms according to the geologic time scale.

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III. Earth Science

Unit of Study: Earth and Space Systems

A. Earth in the Solar System

1. The Earth is the third planet from the sun in the system that includes the moon, the sun, eight other planets and their moons, and smaller objects, such as asteroids and comets (solar system).

a. Describe the features of the planets in terms of size, composition, relative distance from the sun, and ability to support life.
b. Compare and contrast the Earth to other planets in terms of size, composition, and relative distance from the sun, and ability to support life.
c. Describe the features and explain the origins of asteroids, comets, and meteors.

2. The sun, an average star, is central and largest body in the solar system.

a. Describe and classify the main layers of the sun's atmosphere (corona, chromosphere, photosphere) and core.
b. Evaluate how phenomena on the sun's surface (e.g., sunspots, prominences, and solar flares) affect earth.
c. Describe how the solar wind affects Earth (e.g., auroras, interference in radio, television communication).

3. Energy is a property of many substances and is associated with nuclei.

a. Explain the process by which the sun produces energy (fusion).
b. Compare and contrast nuclear fusion and nuclear fission.

4. Most objects in the solar system are in regular and predictable motion which explains such phenomena as the day, the year, phases of the moon, and eclipses.

a. Compare and contrast the Earth's rotation and revolution as they relate to daily and annual changes.
b. Sequence and predict the phases of the moon (e.g., waxing, waning, crescent, new, and full).
c. Demonstrate the arrangement of the sun, the moon, and the Earth during solar and lunar eclipses (include partial eclipses).

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5. Gravity alone holds us to the Earth's surface and explains the phenomena of the tides.

a. Compare and contrast the contributions of Copernicus and Galileo. **(H)**
b. Diagram the relative position of the sun, the moon, and the Earth during tides.
c. Examine the effect of the sun and moon on tides.

6. Seasons result from variations in the amount of the sun's energy hitting the surface, due to the tilt of the Earth's rotation on its axis and the length of the day.

a. Analyze how the parallel rays of the sun effect the temperature of Earth and produce different amounts of heating on Earth's surface.
b. Diagram how the tilt of Earth's axis affects the seasons and the length of day.
c. Relate the seasons to the tilt of the Earth and the angle of the sun's rays.

7. Gravity is the force that keeps planets in orbit around the sun and governs the rest of the motion in the solar system.

a. Examine the role of gravity in keeping the components of the solar system in orbit.
b. Describe the relationship among gravity, distance and mass on orbiting bodies.

Unit of Study: Earth Processes

B. Structure of the Earth System

1. The solid Earth is layered with a lithosphere; hot, convecting asthenosphere within the mantle; and dense metallic core.

a. Describe how seismic wave velocities support the existence of a layered Earth.
b. Explain the relative position, density, and composition of Earth's crust, mantle, and core.
c. Differentiate among composition, density, and location of continental crust and oceanic crust.
d. Identify the lithosphere as comprised of crust and upper mantle.
e. Identify the asthenosphere as the hot convecting mantle below the lithosphere.

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f. Compare the physical nature of the lithosphere (brittle and rigid) with the asthenosphere (plastic and flowing).
g. Examine how the lithosphere responds to tectonic forces (faulting and folding).

2. Some changes in the solid Earth can be described as the "rock cycle." Old rocks at the Earth's surface weather, forming sediments that are buried, then compacted, heated, and often recrystallized into new rock. Eventually, those new rocks may be brought to the surface by the forces that drive plate motions, and the rock cycle continues.

a. Identify and classify minerals that form rocks and explain how recrystallization of these minerals can take place.
b. Distinguish minerals by their physical properties with a dichotomous key.
c. Identify and classify common rock types based on physical characteristics (such as minerals present, grain size, banding or layering, presence of organic material).
d. Compare and contrast intrusive and extrusive igneous rocks; clastic and chemical sedimentary rocks; and foliated and nonfoliated metamorphic rocks.
e. Explain how igneous, metamorphic, and sedimentary rocks are related in a rock cycle.

3. Major geologic events such as earthquakes, volcanic eruptions, and mountain building result from lithospheric plate motions. Landforms and sea-floor features are the result of a combination of constructive (crustal deformation, volcanic eruptions, deposition of sediment) and destructive (weathering, erosion) processes.

a. Illustrate and summarize what causes a volcano to erupt.
b. Compare and contrast how volcanoes are formed at mid ocean ridges, within intra-plate regions, at island arcs, and along some continental edges.

c. Examine how earthquakes result from forces inside Earth (tension, shearing, and compression).
d. Compare and contrast the three major types of seismic waves (primary, secondary, and surface waves).
e. Identify and investigate longitudinal and transverse waves.
f. Describe how the seismograph measures seismic activity (size and type of wave).**(T)**

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g. Demonstrate how an earthquake's epicenter is located by using seismic wave information.
h. Explain the hazards that earthquakes pose to structures. **(P)**
i. Identify ways architectural engineers design and construct buildings in earthquake prone areas (e.g., buildings use shock absorbers and are designed to bend). **(T)**
j. Relate the occurrence of earthquakes and volcanoes to lithospheric plate boundaries using seismic data.
k. Compare and contrast constructive and destructive forces in volcanic and folded mountain building.
l. Identify and interpret geological features using imagery (aerial photography and satellite) and topographic maps. **(T)**
m. Describe the geologic history of South Carolina including the formation of the major landform regions (Blue Ridge, Piedmont, Sandhills, Coastal Plains and Coastal Zone) according to the geologic time scale.
n. Explain the modern distribution of continents to the movement of lithospheric plates since the formation of Pangaea.

4. Lithospheric plates on the scales of continents and oceans move at rates of centimeters per year in response to movement in the asthenosphere.

a. Explain how plate tectonics accounts for the motion of lithospheric plates and the break-up of Pangaea.
b. Compare and contrast the characteristics and interactions of the three types of plate boundaries (divergent, convergent, and transform plate boundaries).
c. Explain how the age of rocks and magnetic data on opposite sides of a divergent boundary are used to estimate the rates at which plates move.
d. Explain how paleoclimate evidence of fossil records supports the theory of plate tectonics.
e. Infer how subduction supports the theory of plate tectonics
f. Examine how the movement of a lithospheric plate over a hot spot formed the Hawaiian Islands.

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IV. Physical Science

Unit of Study: Forces and Motion

A. Motions and Forces

1. The motion of an object can be described by its position, direction of motion, and speed and can be measured and represented on a graph.

a. Operationally define speed, velocity, acceleration, and momentum and apply these in real world situations.
b. Distinguish between speed and velocity in terms of direction.
c. Create and plot a time-distance line graph and make predictions based on the graph.

2. An object that is not being subjected to a force will continue to move at a constant speed in a straight line. If more than one force acts on an object along a straight line then the forces will reinforce or cancel one another depending on their direction and magnitude. Unbalanced forces will cause changes in the speed or direction of an object's motion.

a. Analyze the direction and effects of forces in a variety of situations (e.g., gravity and friction).
b. Compare and contrast forces that are balanced and unbalanced.
c. Use arrows to illustrate the magnitude and direction of a force applied to an object.
d. Analyze the effect of an unbalanced force on an object's motion in terms of speed and direction.
e. Analyze the effect of balanced forces on an object's motion in terms of speed and direction.
f. Predict what happens to an object at rest or an object in motion when unbalanced forces act upon it.
g. Apply Newton's Laws of Motion to the way that a rocket works.
h. Explain how satellites are placed in orbit around Earth.
i. Describe the motion of an object in free fall.
j. Summarize some of the programs that have allowed people to explore space. **(H)**
k. Analyze the benefits generated by space explorations (e.g., food preservations, fabric, insulation materials). **(T)**
l. Predict future space missions and the contributions of those missions. **(H)**

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Unit of Study: Light

B. Transfer of Light Energy

1. The sun's energy arrives as light with a range of wavelength's, consisting of visible light, infrared, and ultraviolet radiation.

a. Identify and distinguish the components of the electromagnetic spectrum (e.g., infrared, visible light, ultraviolet).
b. Compare and contrast the characteristics of waves in various parts of the electromagnetic spectrum
c. Explain how prisms and diffraction gratings refract light and produce the colors in the visible spectrum.
d. Explain in terms of absorption and reflection why a certain color is seen.
e. Explain rainbow phenomena in terms of refraction of sunlight by water droplets in the sky.
f. Relate the importance of using sunscreen to the harmful effects of ultraviolet radiation on the skin. **(P)**

2. Light interacts with matter by transmission (including refraction), absorption, or scattering (including reflection). To see an object light from that object--emitted by or scattered from it--must enter the eye.

a. Distinguish between objects producing light and objects reflecting light.
b. Investigate and describe the properties of reflection, refraction, transmission and absorption of light.
c. Classify objects as opaque, transparent, or translucent.
d. Distinguish between images formed in convex and concave lenses.
e. Analyze how the parts of an eye interact with light to enable a person to see an object.
f. Explain and diagram how images are formed on plane mirrors.
g. Compare and contrast reflecting and refracting telescopes. **(T)**
h. Compare and contrast radio telescopes and light telescopes.
i. Explain how space probes, satellites, radio and light telescopes, and spectroscopes have increased our knowledge of the earth, the solar system, and the universe. **(T)**